MEASUREMENTS OF CARBON DIOXIDE PARTIAL PRESSURE IN THE AIR AND SURFACE SEA WATER ON BOARD THE ICEBREAKER "SHIRASE" (ABSTRACT)

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Continuous measurements of the CO_2 partial pressure in the air and surface sea water were made on board the icebreaker "SHIRASE" between Japan and Antarctica for the periods from November 1987 to April 1988 and from November 1988 to May 1989. The atmospheric CO_2 concentration was high in the mid-northern hemisphere, decreased rapidly southward to a minimum in the mid-southern hemisphere, and increased slightly in the Antarctic region. Irregular variations of the CO_2 concentration were clearly observable, especially in the mid-northern hemisphere, mainly due to alternation and mixing of the continental and maritime air. The CO_2 partial pressure in surface seawater (pCO_2) showed high values in the equatorial region, decreased poleward, and increased again in the Antarctic region. By comparing pCO_2 with the salinity and surface sea temperature measured concurrently, it was found that pCO_2 variations were closely related to upwelling of the deep seawater which is rich in CO_2. The difference of the CO_2 partial pressure between the air and surface seawater (ΔpCO_2) showed negative values in mid-latitudes of both hemispheres and positive values in the equatorial region. This fact implies that the mid-latitude and equatorial oceans act as a sink and source for atmospheric CO_2, respectively. The Antarctic Ocean was generaly a source, but ΔpCO_2 was highly variable there, due to local ocean conditions.

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RADIATION BUDGET OBSERVATION AT ASUKA CAMP, ANTARCTICA, IN 1988 —CLOUD RADIATIVE FORCING—(ABSTRACT)

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Upward and downward radiation on the snow surface were observed at Asuka Camp (72°31′S, 24°08′E, 930 m a.s.l.), Antarctica, from January to December 1988. We have studied the effect of clouds on the surface radiation budget and have found that the long wave (LW) greenhouse effect of clouds exceeded the short wave (SW) albedo effect of clouds, so that net (SW+LW) cloud-radiative forcing on the snow surface was heating. The heating mechanism is explained